

Appl. No.: 09/966,970
Amdt. dated 12/16/2004
Reply to Office action of July 23, 2004

Amendments to the Claims:

Kindly amend Claims 1, 6, 7, 15, 16, 18-20, 23, 24 and 27.

Kindly cancel Claims 4, 11, 13, 17, 21, 22 and 26.

Kindly add new Claims 28-52.

1. (Currently Amended) An imaging device for simultaneous image capture and image display updating, the device comprising:

an imager for capturing image data upon aiming the imager at an image;

a central processing unit (CPU) that is in communication with the imager and issues commands to capture image data;

a direct memory access module in communication with the imager and the CPU that executes the commands to capture image data; and

a memory module in communication with the CPU and the DMA module, the memory module including a first image capture buffer, accessible to the CPU, that temporarily stores first-in-time captured image data prior to displaying first-in-time image data and a second image capture buffer, accessible to the CPU, that temporarily stores second-in-time captured image data prior to displaying second-in-time image data; and

an image enhancer for enhancing image data stored in the first and second image capture buffers prior to display.

2. (Original) The image device of Claim 1, further comprising a display that displays to a user first-in-time image data followed by the display of second-in-time image data.

3. (Original) The image device of Claim 1, further comprising a field programmable gate array device that implements the direct memory access (DMA) module.

4. (Cancelled)

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5. (Original) The image capture device of Claim 1, further comprising a means for re-formatting image data stored in the first and second image capture buffers.

6. (Currently Amended) The image device of Claim [[4]] 1, wherein the memory module further includes an image display buffer that temporarily stores captured image data that has been enhanced prior to display.

7. (Currently Amended) A method for simultaneous image capture and image display in an imaging device, the method comprising the steps of:

capturing first-in-time image data to a first image capture buffer that is in communication with an imager;
enhancing the first-in-time image data after capture to the first image capture buffer;

capturing second-in-time image data to a second image capture buffer that is in communication with an imager; and

displaying the enhanced first-in-time image data on a display while the image device captures the second-in time image data to the second image capture buffer.

8. (Original) The method of Claim 7, further comprising the steps of:
capturing third-in-time image data to the first buffer once the first-in-time image data is displayed; and

displaying the second-in-time image data on a display while the image device captures the third-in-time image data to the first buffer.

9. (Original) The method of Claim 7, wherein capturing first-in-time image data to a first image capture buffer, further comprises the step of:

issuing, at a CPU, a capture command to a DMA module to capture first-in-time image data to the first image capture buffer;

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queuing, at the DMA module, the capture command until the DMA module receives an end-of-frame signal;
executing, at the DMA module, the capture command to capture first-in-time image data to the first image capture buffer; and
transferring the first-in-time image data from the imager to the first image capture buffer.

10. (Original) The method of Claim 7, wherein capturing second-in-time image data to a second image capture buffer, further comprises the step of:

issuing, at a CPU, a capture command to a DMA module to capture second-in-time image data to the second image capture buffer;
queuing, at the DMA module, the capture command until the DMA module receives an end-of-frame signal;
executing, at the DMA module, the capture command to capture second-in-time image data to the second image capture buffer; and
transferring the second-in-time image data from the imager to the second image capture buffer.

11. (Canceled)

12. (Original) The method of Claim 7, further comprising the step of re-formatting the first-in-time image data after capture to the first image capture buffer and before displaying the first-in-time image data on the display.

13. (Canceled)

14. (Original) The method of Claim 8, wherein the step of capturing third-in-time image data to the first buffer once the first-in-time image data is displayed, further comprises the steps of:

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issuing, at a CPU, a capture command to a DMA module to capture third-in-time image data to the second image capture buffer in response to an EOF signal;

queuing, at the DMA module, the capture command until the DMA module receives an EOF signal;

executing, at the DMA module, the capture command to capture third-in-time image data to the first image capture buffer; and

transferring the third-in-time image data from the imager to the first image capture buffer.

15. (Currently Amended) A method for simultaneous image capture and image display in an imaging device, the method comprising the steps of:

issuing a first command to capture first-in-time image data to a first image capture buffer;

issuing a second command to capture second-in-time image data to a second image capture buffer;

executing the first capture command;

signaling end-of-frame (EOF) upon the completion of capturing the first-in-time image data to the first image capture buffer;

enhancing the first-in-time image data that is captured in the first image capture buffer;

issuing a third command to capture third-in-time image data to the first image capture buffer;

executing the second capture command; and

displaying the enhanced first-in-time image data to an imaging device display while the imager executes the second command to capture second-in-time image data to the second image capture buffer.

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16. (Currently Amended) The method of Claim 15, further comprising the steps of:

- signaling end-of-frame (EOF) upon the completion of capturing the second-in-time image data to the second image capture buffer;
- enhancing the second-in-time image data that is stored in the second image capture buffer;
- issuing a fourth command to capture fourth-in-time image data to the second image capture buffer;
- executing the third capture command; and
- displaying the enhanced second-in-time image data to the imaging device display while the imager executes the third command to capture third-in-time image data to the first image capture buffer.

17. (Cancelled)

18. (Currently Amended) The method of Claim ~~[[17]]~~ 15, further comprising the step of storing the enhanced first-in-time image data in an image display buffer prior to displaying the first-in-time image data on the image device display.

19. (Currently Amended) The method of Claim 15, wherein the step of enhancing the second-in-time image data that is stored in the second image capture buffer further comprises the step of ~~further comprising the step of~~ reformatting the first-in-time image data that is stored in the first image capture buffer prior to displaying the enhanced first-in-time image data on the image device display.

20. (Currently Amended) The method of Claim 19, further comprising the step of storing the reformatted first-in-time image data in an image display buffer prior to displaying the enhanced first-in-time image data on the image device display.

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21. (Cancelled)

22. (Cancelled)

23. (Currently Amended) The method of Claim [[22]] 16, further comprising the step of storing the enhanced second-in-time image data in an image display buffer prior to displaying the second-in-time image data on the image device display.

24. (Currently Amended) The method of Claim 16, further comprising the step of reformatting the second-in-time image data that is stored in the second image capture buffer prior to displaying the enhanced second-in-time image data on the image device display.

25. (Original) The method of Claim 24, further comprising the step of storing the reformatted second-in-time image data in an image display buffer prior to displaying the second-in-time image data on the image device display.

26. (Canceled)

27. (Currently Amended) The method of Claim [[26]] 24, further comprising the step of storing the enhanced and reformatted first-in-time and second-in-time image data in an image display buffer prior to displaying the first-in-time and second-in-time image data on the image device display.

28. (New) An imaging device for substantially simultaneous image capture and image display updating, the device comprising:
an imager for capturing image data upon aiming the imager at an image;
a central processing unit (CPU) that is in communication with the imager and issues commands to capture image data; and

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a memory module in communication with the CPU, the memory module including a first image capture buffer, accessible to the CPU, that temporarily stores first-in-time captured image data prior to displaying first-in-time image data and a second image capture buffer, accessible to the CPU, that temporarily stores second-in-time captured image data prior to displaying second-in-time image data.

29. (New) The image device of Claim 28, further comprising a means for enhancing image data stored in the first and second image capture buffers.

30. (New) The image device of Claim 28, wherein the memory module further includes an image display buffer that temporarily stores captured image data that has been reformatted prior to display.

31. (New) The image device of Claim 28, further comprising a direct memory access (DMA) module in communication with the imager, the CPU and the memory module, wherein the DMA module executes the commands to capture image data.

32. (New) The image device of Claim 28, further comprising an image reformatter for re-formatting image data stored in the first and second image capture buffers prior to display.

33. (New) A portable data acquisition and display device, the device comprising:
an imaging barcode reader for capturing image data and decoding bar code symbols;
a processor in communication with the barcode reader;

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a memory unit, in communication with the processor, for storing image data captured by the imaging barcode reader, wherein the memory unit includes a plurality of image capture buffers that are configured to store image data;

a display device, in communication with the processor; and

a memory control element, in communication with the memory unit and the processor, for controlling image data in the plurality of image capture buffers such that

first image data is stored in a first image capture buffer,

second image data is stored in a second image capture buffer

while the first image data is being distributed from the first image capture buffer to the display, and

third image data is stored in one of the plurality of image capture buffers while the second image data is being distributed from the second image capture buffer to the display.

34. (New) The device of Claim 33, wherein the memory control element for controlling image data in the plurality of image capture buffers such that third image data is stored in one of the plurality of image capture buffers while the second image data is being distributed from the second image capture buffer to the display further defines the one of the plurality of image capture buffers as the first image capture buffer.

35. (New) The device of Claim 33, wherein the memory control element for controlling image data in the plurality of image capture buffers such that third image data is stored in one of the plurality of image capture buffers while the second image data is being distributed from the second image capture buffer to the display further defines the one of the plurality of image capture buffers as a third image capture buffer.

36. (New) The device of Claim 34, wherein the memory control element for controlling image data in the plurality of image capture buffers further comprises controlling

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image data in the image capture buffers such that fourth image data is stored in one of the plurality of buffers while the third image data is being distributed from the first image capture buffer to the display.

37. (New) The device of Claim 35, wherein the memory control element for controlling image data in the plurality of image capture buffers further comprises controlling image data in the image capture buffers such that fourth image data is stored in one of a plurality of buffers while the third image data is being distributed from the third image capture buffer to the display.

38. (New) The device of Claim 33, wherein the memory control element is further defined as controlling image data in the plurality of image capture buffers such that first image data is stored in a first image capture buffer, second image data is stored in a second image capture buffer substantially simultaneous with the first image data being distributed from the first image capture buffer to the display, and third image data is stored in one of the plurality of image capture buffers substantially simultaneous with the second image data being distributed from the second image capture buffer to the display.

39. (New) The device of Claim 33, wherein the memory control element includes an image processing module for processing the image data.

40. (New) The device of Claim 39, wherein the image processing module provides for enhancement of the image data.

41. (New) The device of Claim 39, wherein the image processing module provides for reformatting of the image data.

42. (New) The device of Claim 33, wherein the portable data acquisition and display device is further defined as a handheld device.

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43. (New) The device of Claim 33, wherein the imaging barcode reader for capturing image data and decoding bar code symbols further defines the bar code symbols as chosen from the group consisting of one-dimensional bar code symbols and two dimensional bar code symbols.

44. (New) The device of Claim 33, wherein the memory control element is in communication with the imaging barcode reader.

45. (New) The device of Claim 33, wherein the memory control element is in communication with the display device.

46. (New) A method for image capture and display in an imaging barcode reader device including a display, the method comprising the steps of:
capturing a first image with an imaging barcode reader;
storing the first image in a first image capture buffer of a plurality of image capture buffers;
capturing a second image with the imaging barcode reader;
storing the second image in a second image capture buffer of the plurality of image capture buffers;
distributing the first image to the display while the second image is being stored in the second image capture buffer;
capturing a third image with the imaging barcode reader;
storing the third image in one of the plurality of image capture buffers; and
distributing the second image to the display while the third image is being stored in one of the plurality of image capture buffers.

47. (New) The method of Claim 46, wherein the step of distributing the first image to the display while the second image is being stored in the second image capture buffer is further

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defined as distributing the first image to the display substantially simultaneous with the second image being stored in the second image capture buffer.

48. (New) The method of Claim 46, wherein the step of storing the third image in one of the plurality of image capture buffers after the first image has been distributed to the display is further defined as storing the third image in the first image capture buffer after the first image has been distributed to the display.

49. (New) The method of Claim 46, wherein the step of storing the third image in one of the plurality of image capture buffers after the first image has been distributed to the display is further defined as storing the third image in a third image capture buffer.

50. (New) The method of Claim 46, wherein the step distributing the second image to the display while the third image is being stored in one of the plurality of image capture buffers is further defined as distributing the second image to the display substantially simultaneous with the third image being stored in one of the plurality of image capture buffers.

51. (New) The method of Claim 46, further comprising the steps of enhancing the first image data stored in the first image capture buffer prior to distributing the first image data to the display and enhancing the second image data stored in the second image capture buffer prior to distributing the second image data to the display.

52. (New) the method of Claim, further comprising the step of reformatting the first image data stored in the first image capture buffer prior to distributing the first image data to the display and reformatting the second image data stored in the second image capture buffer prior to distributing the second image data to the display.